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Common Data for Questions 1 and 2:

The velocity field of a two-dimensional fluid flow is as follows:

$$u = U_0 \frac{x}{L}, v = -U_0 \frac{y}{L}$$

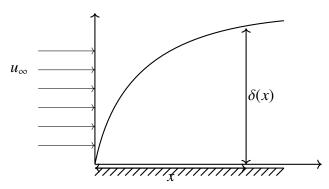
Where, U_0 and L are, respectively, the characteristic velocity and length.

- 1) If L = 0.2m and the resultant of total accelerations in x- and y- directions at (x = L, y = L) is 10m/s^2 , the magnitude of U_0 (m/s) is
 - a) 1.414
 - b) 2.38
 - c) 1.19
 - d) 11.90
- 2) The above fluid flow can be described as
 - a) rotational and compressible
 - b) irrotational and compressible
 - c) rotational and incompressible
 - d) irrotational and incompressible

Linked Answer Questions

Statement for Linked Answer Question 3 and 4

The boundary layer formation over a flat plate is shown in the figure below. The variation of horizontal velocity (u) with y at any x along the plate in the boundary layer is approximated as: $u = P \sin(Qy) + R$



- 3) The most acceptable boundary conditions are
 - a) at y = 0, u = 0; at $y = \delta$, $u = U_{\infty}$; at y = 0, $\frac{du}{dy} = 0$

 - b) at y = 0, $u = U_{\infty}$; at $y = \delta$, $u = U_{\infty}$; at y = 0, $\frac{du}{dy} = 0$ c) at y = 0, u = 0; at $y = \delta$, $u = U_{\infty}$; at $y = \delta$, $\frac{du}{dy} = 0$ d) at y = 0, $u = U_{\infty}$; at $y = \delta$, $u = U_{\infty}$; at $u = \delta$, $u = U_{\infty}$; at $u = \delta$, $u = U_{\infty}$
- 4) Expressions for P, Q and R are

- a) P = 0; Q = 0; R = 0
- b) $P = U_{\infty}$; Q = 0; R = 0
- c) $P=0; Q=\frac{\pi}{2\delta}; R=U_{\infty}$
- d) $P = U_{\infty}; Q = \frac{\pi}{2\delta}; R = 0$

Useful Data

Avogadro's number $: 6.023 \times 10^{23} \text{ mol}^{-1}$ Boltzmann's constant (k_B) $: 1.38 \times 10^{-23} \text{ J K}^{-1}$ Electron charge (e) $: 1.602 \times 10^{-19} \text{ C}$ Gas Constant $: 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ Electron rest mass $: 9.1 \times 10^{-31} \text{ kg}$ Permittivity of vacuum (ε_0) $: 8.854 \times 10^{-12} \text{ F m}^{-1}$

Planck's constant (h) $6.626 \times 10^{-34} \text{ J s}$ Bohr magneton (μ_B) $9.27 \times 10^{-24} \text{ A m}^2$ Free space permeability (μ_0) $4\pi \times 10^{-7} \text{ H m}^{-1}$

 $1J = 6.242 \times 10^{18} \text{ eV}$ $1texteV = 1.602 \times 10^{-19} \text{ J}$

1cal = 4.2 J

- 5) The number of lattice points in an ideal Perovskite unit cell is
 - a) 1
 - b) 2
 - c) 4
 - d) 5
- 6) A Frenkel defect is
 - a) a pair of cation and anion vacancy
 - b) a pair of cation interstitial and cation vacancy
 - c) a cation vacancy
 - d) an anion vacancy
- 7) The angle between the line vector of a screw dislocation and the Burgers vector is
 - a) 0 degrees
 - b) 45 degrees
 - c) 60 degrees
 - d) 90 degrees
- 8) The addition of a network modifier to silica
 - a) produces vacancies
 - b) enchances the network structure
 - c) disrupts the network structure
 - d) increases the viscosity
- 9) The best semiconductor material for LED in the visible range is
 - a) Si
 - b) Ge
 - c) GaAs
 - d) $GaAs_0 _6P_{0.4}$
- 10) A plain carbon steel sample is water-quenched from 900°C to room temperature. Its microstructure will consist of
 - a) pearlite
 - b) bainite

- c) martensite
- d) ferrite and pearlite
- 11) Graphite at zero Kelvin is a
 - a) good conductor
 - b) insulator
 - c) semiconductor
 - d) semi-metal
- 12) A high molecular weight polyethylene has an average molecular weight of 560,000g/mol. Its average degree of polymerization is
 - a) 15,000
 - b) 18,660
 - c) 19,310
 - d) 20,000
- 13) In which region of the spectra crystal lattice absorption is very significant
 - a) ultraviolet
 - b) visible
 - c) microwave
 - d) infrared